



## EFFECTIVENESS OF BLENDED TEACHING OF PROBLEM-BASED LEARNING (PBL) AND ERROR-BASED LEARNING (EBL) IN GYNECOLOGY

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### ABSTRACT

**Objective:** The objective of this study was to determine whether combined PBL-ABE teaching was effective in gynecology students.

**Methodology:** A prospective and observational study was carried out with 200 gynecology students of the tenth semester and internships, who were randomly divided into two groups for the combined PBL-ABE system and the traditional group. Pre- and post-class surveys were conducted to assess their perceptions and experiences with the method.

**Results:** In the pre-class questionnaire, the traditional system obtained significantly higher scores than the PBL-EBL group (75.34 vs. 70.43 and 35.43 vs. 23.34),  $P = 6.39 \times 10^{-5}$ . In the PBL-EBL group, basic knowledge and case analysis scores increased significantly, 72.23 vs. 68.51 and 31.23 vs. 30.24, respectively ( $P = 0.612$ ). The PBL-EBL group improved much more than the traditional group; the PBL-EBL saw an increase from 70.43 to 72.23 compared to the traditional one from 75.43 to 68.51. On the other hand, in terms of time spent in class, the PBL-EBL system scored significantly lower than the traditional system ( $P < 0.001$ ).

**Conclusion:** PBL together with EBL can be an effective method to improve the performance and clinical skills of medical students and interns.

**Keywords:** Problem-based Learning, Error-based Learning, Traditional System, Master Lectures, Gynecology, Practical Clinical Teaching, PBL, EBL.

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## EFICÁCIA DO ENSINO COMBINADO DE APRENDIZAGEM BASEADA EM PROBLEMAS (PBL) E APRENDIZAGEM BASEADA EM ERROS (EBL) NA GINECOLOGIA

### RESUMO

**Objetivo:** O objetivo deste estudo foi determinar se o ensino combinado ABP-ABE foi eficaz nos alunos de ginecologia.

**Metodologia:** Um estudo prospetivo e observacional foi realizado com 200 estudantes de ginecologia do 10º semestre que foram divididos aleatoriamente em dois grupos para o sistema combinado ABP-ABE e o grupo tradicional. Foram realizadas pesquisas pré e pós-aula para avaliar suas percepções e experiências com o método.

**Resultados:** No questionário pré-classe, o sistema tradicional obteve pontuações significativamente maiores do que o grupo ABP-ABE (75,34 versus 70,43 e 35,43 versus 23,34),  $P = 6,39 \times 10^{-5}$ ). No grupo ABP-ABE, as pontuações de conhecimento básico e análise de caso aumentaram significativamente, 72,23 versus 68,51 e 31,23 versus 30,24, respectivamente ( $P = 0,612$ ). O grupo ABP-ABE melhorou muito mais do que o grupo tradicional; ABP-ABE viu um aumento de 70,43 para 72,23 em comparação com o grupo tradicional de 75,43 para 68,51. Por outro lado, em termos de tempo gasto na aula, o sistema ABP-ABE obteve pontuações significativamente menores do que o sistema tradicional ( $P < 0,001$ ).

**Conclusão:** a ABP, juntamente com a ABE, pode ser um método eficaz para melhorar o desempenho e as habilidades clínicas de estudantes de medicina e estagiários.

**Palavras-chave:** Aprendizagem Baseada em Problemas, Aprendizagem Baseada em Erros, Sistema Tradicional, Palestras de Mestrado, Ginecologia, Ensino Clínico Prático, ABP, ABE.

## EFFECTIVIDAD DE LA ENSEÑANZA COMBINADA DEL APRENDIZAJE BASADO EN PROBLEMAS (ABP) Y BASADO EN ERRORES (ABE) EN GINECOLOGÍA

### RESUMEN

**Objetivo:** El objetivo de este estudio fue determinar si la enseñanza combinada ABP-ABE fue efectiva en los estudiantes de ginecología.

**Metodología:** Se llevó a cabo un estudio prospectivo y observacional con 200 estudiantes de ginecología del décimo semestre e internados, que se dividieron aleatoriamente en dos grupos para el sistema combinado ABP-ABE y el grupo tradicional. Se realizaron encuestas previas y posteriores a la clase para evaluar sus percepciones y experiencias con el método.

**Resultados:** En el cuestionario previo a clase, el sistema tradicional obtuvo puntuaciones significativamente más altas que el grupo ABP-ABE (75.34 frente 70.43 y 35.43 frente 23.34),  $P = 6.39 \times 10^{-5}$ . En el grupo ABP-ABE, las puntuaciones de conocimientos básicos y análisis de casos aumentaron significativamente, 72.23 frente a 68.51 y 31.23 frente a 30.24, respectivamente ( $P = 0.612$ ). El grupo ABP-ABE mejoró mucho más que el grupo tradicional; el ABP-ABE experimentó un aumento de 70.43 a 72.23 en comparación con el tradicional de 75.43 a 68.51. Por otro lado, en cuanto al tiempo dedicado a la clase, el sistema ABP-ABE obtuvo puntuaciones significativamente más bajas que el sistema tradicional ( $P < 0,001$ ).

**Conclusión:** ABP junto con ABE puede ser un método efectivo para mejorar el rendimiento y las habilidades clínicas de los estudiantes e internos de medicina.

**Palabras clave:** Aprendizaje Basado en Problemas, Aprendizaje Basado en Errores, Sistema Tradicional, Conferencias Magistrales, Ginecología, Enseñanza Clínica Práctica, ABP, ABE.

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## 1 INTRODUCTION

The normative education of health professionals is in line with the advancement of technology and scientific development in medicine, both locally and internationally. [1][2][3]. Medical careers are using a variety of strategies in the development of effective teaching methodology; to have a solid base of scientific knowledge and skills in medical students for the analysis of problems or cases[4][5] that respond to the high demand of recent years, improving the vacuum of medical training. The traditional teaching system has been the learning method that has adopted medical teaching.[6] Master classes have been the popular way of teaching, for their effectiveness in transmitting knowledge, particularly for the large number of students, however the research production presented by the lectures are not effective for the learning of skills and critical thinking that is required in higher education such as medicine; [7] This is because the traditional method is centered on the teacher who passively transmits knowledge to the student.[8]

Error-based learning (ABE) is an approach to teaching mistakes for the purpose of learning; teachers design mistakes for students to analyze and substantiate the causes of mistakes, and students gain lasting, reasoned learning by correcting them. Problem-based learning (PBL) is defined as a learning strategy in which students develop self-learning and whole-of-thought skills by solving problems through self-study, research, and small group cooperation.[9] . This represents a pedagogical shift in the approach to teaching and learning.

Compared to the traditional system, ABE focuses on outcomes that foster logical reasoning ability in students. Teachers ask mistaken questions of students using their observation, conclusion, and problem-solving skills. PBL is considered a method that allows divergent thinking that is problem-oriented by giving students the initiative in learning; therefore, it is the responsibility of students to express their concerns and work in small groups to resolve them.[10]

Research "on the effects of error generation on episodic memory" demonstrated that EBA is an effective strategy for problem solving, such as the analytical skills of medical students and physicians[11][12]. Compared to the traditional system, many systematic reviews showed high levels of satisfaction and active participation.[13][14] But if the ABP and ABE methodologies are used on their own, there are limitations.[12][15] The EBA takes a long time for teachers to prepare for mistakes, accumulate enough materials to support clinical teaching, and ask questions that students discuss, leading to students not being actively involved and feeling exalted by the learning experience. PBL was not effective in curricula, which would



improve knowledge foundations and clinical performance.[16] Computer-assisted learning (CAA), which does not replace traditional teaching, is one of the new tools suggested to facilitate the development of PBLs.[15]

The ABP is student-centered and plays an important leadership role in the classroom, allowing you to have time to prepare problems and materials before each class, making it difficult for medical students. In addition, the PBL induces students to take the initiative, but the lack of interest from teachers will make students understand the program, which affects the quality of the method. Therefore, the following hypothesis is proposed: the combined teaching of PBL and EBA could improve the development of affective learning and the learning quality of medical students.

The literature of medical teaching indicates that there is no combined ABP-ABE method in medical education, especially in the inmates of gynecology, which is a fundamental specialty dedicated to the study of women.

This research implemented the combined ABP-ABE teaching system in 10th semester medical students and gynecology interns in their pre-professional practices. He compared the method to the traditional teaching system. This study provides information on assessing students' reasoning in a variety of areas, from basic knowledge to problem solving; it also analyzes their perspectives, their competencies, their self-perception and their satisfaction during the ABP-ABE learning process.

## 2 METHODS

### 2.1 PARTICIPANTS

Prospective, random and controlled research. From September 2022 to April 2023, 10th semester medical students from the Faculty of Medical Sciences of the University of Guayaquil and gynecology interns from the Ceibos general hospital north of the city of Guayaquil were registered. All required obstetric diseases were treated. Students were randomly divided into two groups: one for the ABP-ABE teaching system and one for the traditional lecture-based teaching system. Students did not know what their group assignments were in the classroom. The groups were divided into different schedules and those who received classes at the same time were divided upwards according to their identification. Thus, each student received a numbering ranging from 1 to 200; odd numbers were recorded in the ABP-ABE system, while even numbers were recorded in the traditional system. The instructor and three attending



physicians from the gynecology service supervised these groups. The Ethics Committee of the Ceibos Hospital north of Guayaquil approved the informed consent of all participants.

## 2.2 STUDY DESIGN

Because hypertensive disorders of pregnancy are considered the second leading cause of maternal death, we decided to use the combined ABP-ABE approach for this study. The program of the ABP-EBA system was organized as follows. The instructor prepared lecture videos and companion materials for the course before the class. Students received five reference articles related to course topics, general diagnostic and treatment guidelines, and approximately 30-minute video materials on operating procedures. Each student was required to review these materials during free time outside of class. Before the start of the activities, a questionnaire with ten multiple-choice questions on hypertensive disorders of pregnancy was delivered.

The instructor introduced the topic and agenda of activities before the class session. Then, a problem of a patient with slides posing errors in the raised slogans that focused on hypertensive disorders of pregnancy was presented. Second, under the direction of the instructor, the students argued in small groups. In discussions, participants are asked relevant questions with errors and asked to search for answers on the Internet or in the library's databases. Third, the group leader made the presentation to review the most important points of the lesson and give the group the answers that were resolved and the unresolved ones. Finally, the instructor summarized the class and retouched the challenging questions that arose in the discussion. At the end of these activities, students were asked to answer a post-class questionnaire that contained the same questions about hypertensive disorders of pregnancy as the pre-class questionnaire. Finally, they were asked to complete a 10-question questionnaire about their perceptions and experiences with the combined ABP-ABE classroom.

The traditional system was subsequently organized. Instead of watching videos or reading lengthy articles, they were asked to review a preview of the course. They were also asked to answer the pretest questionnaire with the 10 multiple choice questions that were used in the ABP-ABE system. The traditional teaching method used to teach students the content taught to them by the teacher with a full explanation of the theoretical knowledge that was not divided into small groups to discuss the problem. After the classes, they were asked to answer the same questionnaire as the ABP-ABE group.

All students received an informed consent form, were told to participate in questionnaires and surveys on a voluntary basis. The results of the questionnaires and survey



had no impact (positive or negative) on students' grades or performance because identification numbers were used instead of real names. Students completed the questionnaires and survey independently of their classmates and the teacher. A graphical description of the study design is shown in Figure 1.

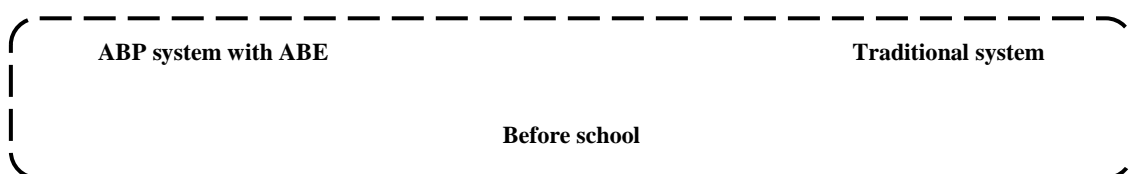
### 2.3 DATA ASSESSMENT AND STATISTICAL ANALYSIS

Pre- and post-course tests were conducted to evaluate what students learned in the course of Hypertensive Disorders in Pregnancy. The set of questions includes basic theory questions (10 points) and problem analysis questions (10 points). All questions are based on Bloom's taxonomy [17][18], which classifies cognitive activities into six hierarchical levels, namely memory, understanding, application, analytical skills, evaluation, and creativity. The categories "Remember" and "Understand" were combined into a single category called "Basic Theoretical Knowledge". Entries in any other category are considered "Clinical Case Analysis."

After the course, students from both groups were asked to complete the same anonymous questionnaire to assess their perceptions and experiences. The post-course questionnaire includes 10 questions, including questions about motivation, comprehension, student-teacher interaction, time off during the course, end-of-course test, communication and communication skills, clinical reasoning ability, self-study skills, teamwork, skills, and knowledge absorption.[17] The endpoints were based on a previous study. Depending on the level of improvement, scores are divided into 5 levels, from 1 (bad) to 5 (excellent). Unlike the other areas recorded, by the free time consumed, 1 represents the least time consumption, while 5 indicates the most time. The reliability of the questionnaire was evaluated with Cronbach's alpha coefficient of 0.872.

#### Figure 1

*Graphical description of the study design, applying the two learning models: the model combines ABP-ABE and the traditional model*





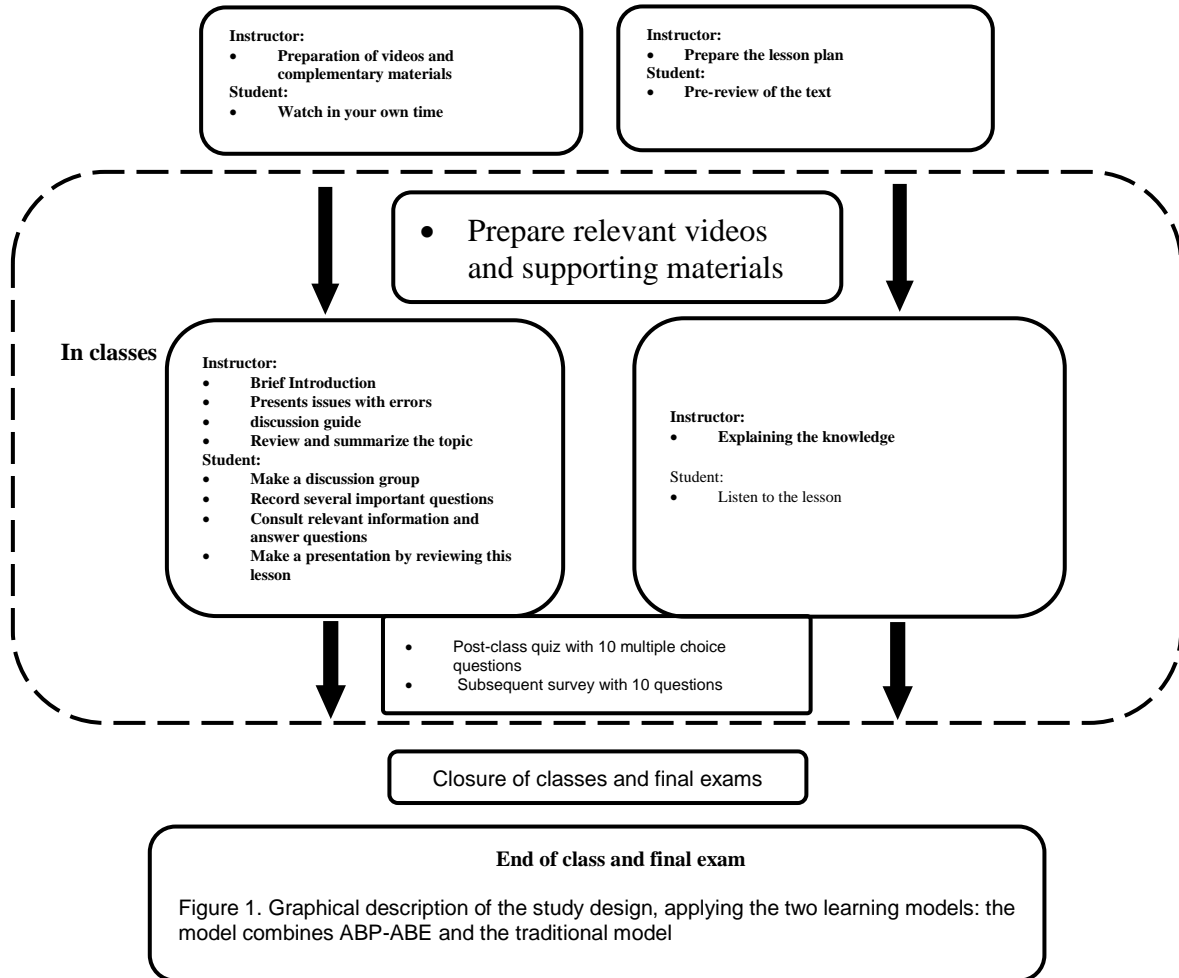


Figure 1. Graphical description of the study design, applying the two learning models: the model combines ABP-ABE and the traditional model

For each system, the time students spent preparing before class is measured. In the ABP-ABE system, students' preparation time was recorded by watching lecture videos and course-related reading materials, as well as searching for additional materials on the Internet. Meanwhile, in the traditional model, students use pre-recorded time to review textbooks.

We compared the effectiveness of ABP-ABE with traditional teaching methods for all 10th semester and interns. In addition, to avoid biases related to different types of students, we also observed two teaching methods with 10th semester students and interns in subgroups.

We add up the total scores and then compare the scores produced by both systems using an independent sample t-test. We also compare the data generated by the system before and after the lesson using a paired sample t-test. The chi-square test was used to compare proportions. All statistical analyzes were performed with SPSS version 20.0 (Chicago, USA). United States). Alpha was set at 0,05 and P values below 0,05 were considered significant. The charts were created using RStudio, the "ggplot2" library was used to create the bar chart showing the average result, and the dplyr library, which allows you to manipulate and sort the data into data frames, ensuring that everything is organized.



### 3 RESULTS

#### 3.1 FEATURES AND BASIC INFORMATION

From September 2022 to April 2023, a total of 200 students will be enrolled; 100 from the tenth semester in obstetrics and 100 in the obstetrics and gynecology boarding school. Of these, 100 students were assigned to the ABP-ABE system (50 students of 10th semester and 50 interns) and 100 to the traditional system (50 students of 10th and 50 interns). 17 students were excluded from the ABP-ABE group: 11 students were discharged before the course, despite having signed an informed consent, and 6 students were excluded for having incomplete values in their questionnaire. The average age of the students was  $22.49 \pm 1.443$  years. By gender, 100 students are women, or 50%. Table 1 compares the initial characteristics of students in the PBL-ABE system and the traditional system.

**Table 1**

*Basic characteristics of all participants*

Item	ABP-ABE system (N=100)	Traditional system (N=100)	Statistics	P-value
Degree			$X^2=0.001$	0.981
10th semester	50	50		
Medical interns	50	50		
Gender			$X^2=0.525$	0.469
Male	55	45		
Female	45	55		
Age	$22.49 \pm 1.443$	$22.49 \pm 1.443$	$T=0.850$	0.396

There were no significant differences between the two systems in terms of gender, age or grades ( $P > 0.05$ ). In addition, the students of the tenth semester and interns of the traditional system did not show statistical significance in terms of the demographic characteristics against the ABP-ABE system, in Table 2. The average time spent on pre-class preparation in ABP-ABE systems and the traditional system was  $107.23 \pm 14.512$  and  $95.60 \pm 15.631$ , respectively ( $P < 0.001$ ).

**Table 2**

*Comparison of test scores between ABP-ABE and traditional group*

Items.	System	System	T	P-value
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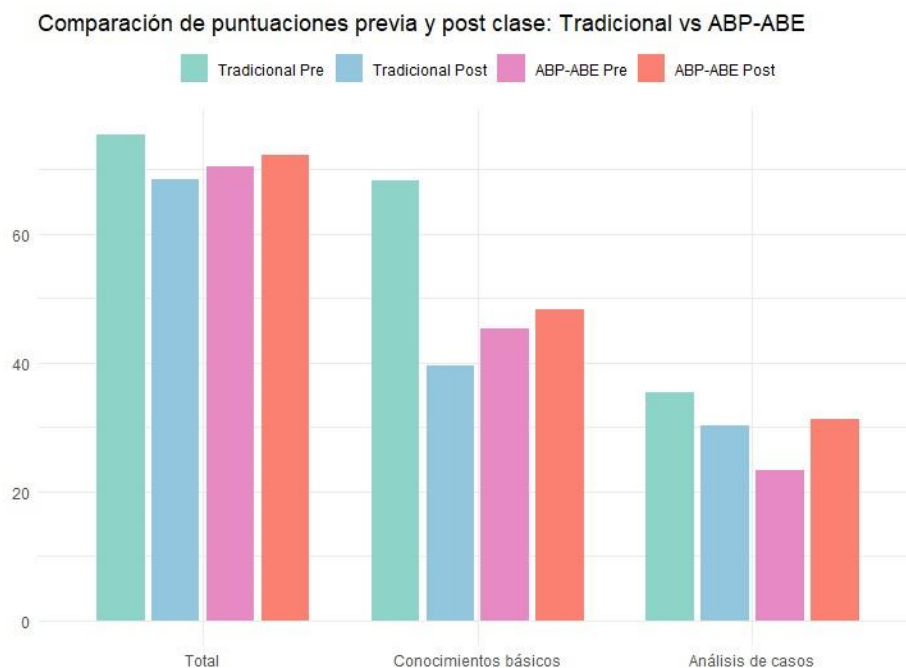
	<b>ABP-ABE (N=100)</b>	<b>Traditional (N=100)</b>		
<b>Total score before class</b>	70.43 ± 12.23	75.34 ± 12.3	-2.83	0.0051
Basic knowledge score Pre-class	45.23 ± 15.32	68.35 ± 13.3	-11.39	2.28x10 <sup>-23</sup>
Case analysis score Pre-class	23.34 ± 12.4	35.43 ± 13.2	-6.67	2.43 x10 <sup>-10</sup>
<b>Total post-class score</b>	72.23 ± 12.5	68.51 ± 11.32	205	0.028
Basic knowledge score Post-class	48.25 ± 13.23	39.51 ± 13.3	4.65	5.82x10 <sup>-6</sup>
Case analysis score Post-class	31.23 ± 14.2	30.24 ± 13.4	0,507	0.612

Comparison of test scores between ABP-EBA and the traditional pre- and post-class system; mean pre-class test score and core knowledge and case analysis scores were 70.43 ± 12.23; 45.23 ± 15.32; 23.34 ± 12.4 respectively.

While, for the traditional system were 75.34 ± 12.3; 68.35 ± 13.3; 35.43 ± 13.2, respectively. It is notable that the scores of the traditional system pre-class tests were significantly higher than those of the ABP-ABE system ( $P < 0.05$ ). After class, the total mean post-class test score and basic knowledge scores for the ABP-ABE group increased significantly, from 72.23 ± 12.5; 48.25 ± 13.23; respectively ( $P < 0.05$ ), except for the post-class case analysis score which could not be found to have significant differences in its means, 31.23 + 14.2; 30.24 + 13.4 ( $P < 0.05$ ) (Figure 2).

**Figure 2**

*Comparison of previous and post-class scores: Traditional vs ABP-ABE*





Similarly, in the traditional system, the average total score decreased significantly from  $75.34 + 12.3$  to  $68.51 + 11.32$  ( $P = 6.39 \times 10^{-5} < 0.05$ ); likewise, the scores of basic knowledge and case analysis also decreased significantly from  $68.35 + 13.3$  to  $39.51 \pm 13.3$  and from  $35.43 \pm 13.2$  to  $30.24 \pm 13.4$  respectively ( $P < 0.05$ ). Meanwhile, the average total score and basic knowledge scores in the ABP-EBA system were not found to differ significantly in their means  $70.43 + 12.23$  to  $72.23 + 12.5$  and  $45.23 + 15.32$  to  $48.25 \pm 13.23$ , while for case analysis the scores increased significantly from  $23.34 \pm 12.4$  to  $31.23 \pm 14.2$  ( $P = 4.31 \times 10^{-5} < 0.05$ ). (Table 3 and 4)

**Table 3**

*Comparison of the previous and post-class scores of the Traditional System*

Items.	Pre-class score	Post-class score	T	P-value
Total	$75.34 + 12.3$	$68.51 + 11.32$	4.08	$6.39 \times 10^{-5}$
basic knowledge	$68.35 + 13.3$	$39.51 + 13.3$	15.33	$1.70 \times 10^{-35}$
Case analysis	$35.43 + 13.2$	$30.24 + 13.4$	2.75	0,006

**Table 4**

*Comparison of the previous and post-class scores of the ABP System*

Items.	Pre-class score	Post-class score	T	P-value
Total	$70.43 \pm 12.23$	$72.23 \pm 12.5$	-1.02	-1.02
basic knowledge	$45.23 \pm 15.32$	$48:25 \pm 13:23$	-1.49	-1.49
Case analysis	$23.34 \pm 12.4$	$31.23 \pm 14.2$	-4.18	-4.18

Table 5 assesses students' opinions based on self-perceived competence and competition between the ABP-ABE group and the traditional group; We found that students' motivation to learn, content understanding, student-teacher interaction, self-assessment, communication skills and clinical judgment; thinking ability; self-study skills; teamwork skills and ability to absorb knowledge in the ABP-ABE group were significantly higher than in the traditional system ( $P < 0.05$ ) (Table 5). The score representing students' free time during class (time spent doing work before and after class) was significantly lower in the ABP-ABE group than in the traditional group ( $P < 0.05$ ) (Table 3).

Academic satisfaction in both groups was assessed by follow-up tests, which were considered satisfactory if they scored 80 points. In the ABP-ABE group, the skills of comprehension, communication, clinical reasoning, self-study, teamwork and knowledge



acquisition obtained more than 80 points, a figure higher than that of the traditional group. However, there were no statistically significant differences between the two groups. (Table 5 and Figure 3).

**Table 5**

*Comparison of perspectives and self-perceived competence in the ABP-ABE system versus the traditional system (for all participants)*

Item	ABP-ABE system (N=100)	Traditional system (=100)	T	95% confidence interval	P-value
Teachers motivated me to do my teaching activities better.	4.72 ± 0.64	3.97 ± 1.04	6.14	(0.50,0.99)	5.91 x 10 <sup>-9</sup>
My teachers explained the contents clearly in lectures and other theoretical activities.	4.39 ± 0.96	4.14 ± 1.005	1.79	(-0.024,0.52)	0.07
Perform, at the teacher's direction, literature search activities, case discussions or other teaching activities using the English language	4.5 ± 0.80	3.66 ± 1.19	5.85	(0.55,1.12)	2.30x 10 <sup>-8</sup>
The teachers assigned me independent work (homework) to do collectively with other students in my course.	4.44 ± 0.92	4.1 ± 0.85	2.7	(0.09,0.58)	0,007
During the performance of practical activities in the hospital room or other health care scenarios, I have had the accompaniment of my teachers.	4.41 ± 1.00	3.98 ± 0.93	3.14	(0.16,0.69)	0,001
The types of teaching activities and their distribution in the subject were sufficient for the achievement of my practical skills.	4.53 ± 0.86	4.06 ± 0.93	3.71	(0.22,0.71)	0.0002
During the course I had opportunities to develop the professional skills that corresponded to the objectives of the teaching program.	4.59 ± 0.71	4.03 ± 0.91	4.85	(0.33,0.78)	2.57x 10 <sup>-6</sup>
I applied in the theoretical and practical activities of this subject the acquired knowledge of Embryology, Microbiology and	4.50 ± 0.85	3.97 ± 0.91	4.25	(0.28, 0.77)	3.21x 10 <sup>-6</sup>



Medical

Parasitology.

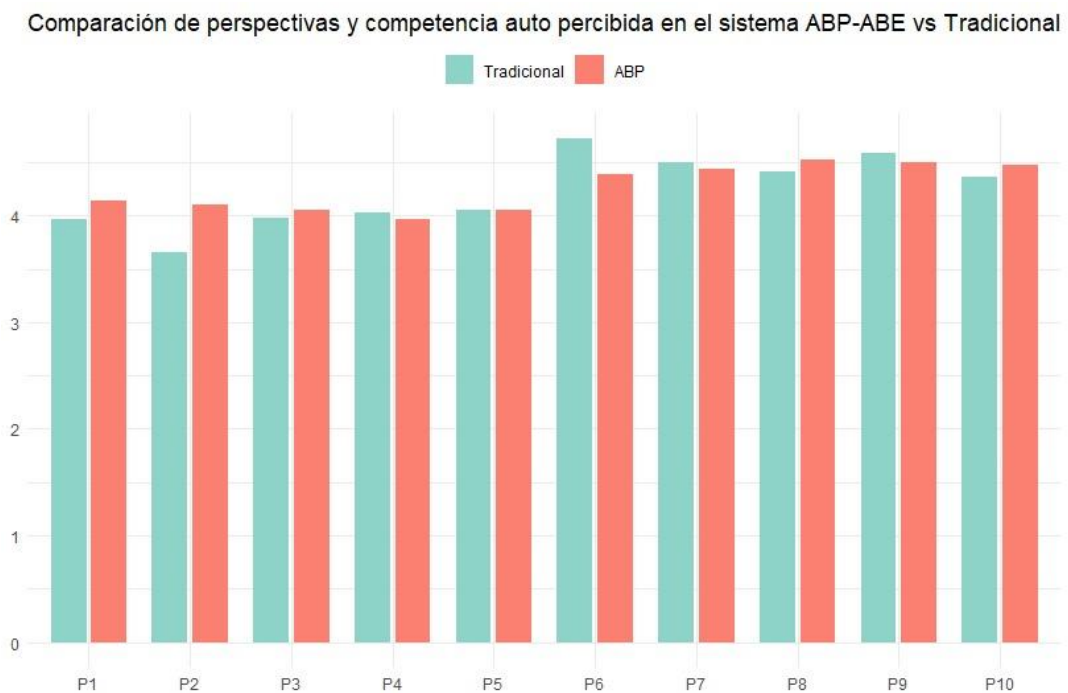
This subject helped me learn to self-evaluate and evaluate other students.

The subject helped develop my problem-solving skills.

$4.36 \pm 1.04$	$4.06 \pm 0.97$	2.10	(0.019,0.58)	0.036
$4.48 \pm 0.87$	$4.06 \pm 1.03$	3.11	(0.15,0.68)	0,002

**Figure 3**

*We observe the perspectives and self-perceived competences with the ABP-ABE compared to the traditional model*



**4 DISCUSSION**

The traditional education system is the most economical and effective means of delivering theoretical education.[19][20] However, this system is not suitable for advanced medical students to develop communication skills and clinical reasoning. With the advent of the Internet, information has grown rapidly and personal computers and mobile devices have turned e-learning into a tool in higher education, allowing medical students to obtain useful information in a short time. Think and ask questions; Getting new information is an important part of education.[21][22] In this process, the PBL and EBA teaching strategies, which differ from traditional teaching methods, aim to facilitate health and encourage students to actively move from “what I learned” to “what” I want to learn.[23]



Most studies focus specifically on PBL and EBA[24][25][26][27][28][14][29] compared to traditional education systems, and some studies have demonstrated the advantages of PBL or EBA. For example, the ABP created an approach to small group learning characterized by broader communication between faculty and students to achieve individual learning goals,[30] while ABE emphasized that staff prepare clinical case reports and documentation to help students develop holistically and effectively clinical skills. The student learns theoretical techniques[31]. Taking into account these individual strengths, this study combined PBL and EBA teaching methods so that they could complement and improve each other.

We study the effectiveness and acceptability of the teaching method integrating ABP-ABE in the subject of obstetrics and gynecology compared to traditional teaching systems. We recognize that the integrated ABP-ABE training has not yet been implemented in the courses of obstetrics and gynecology. In our study, the overall score of the case analysis and the pretest in the traditional system was much higher than the score in the ABP-ABE system (75.34 vs. 70.43 and 35.43 vs. 23.34), this shows the advantage of the pretest because students of the traditional educational system memorize basic knowledge of textbooks.

In contrast, students in the ABP-ABE group had no study materials and were close to clinical practice. Therefore, it is believed that the difference in pre-test scores between the two systems is not due to the quality of the study materials. But due to the different characteristics of teaching methods, the traditional method possesses more knowledge through the memorization of books.

ABP-ABE students reviewed material throughout the course without detailed case analysis or discussion topics, and comparing total course scores as well as case analysis showed that the ABP-ABE group achieved significantly better results than the traditional group (72.23 vs. 68.51). and (31.23 vs. 30.24). This explains the effectiveness of the ABP-ABE training model. The average total score and the basic knowledge score were not significantly different on average between the two systems ( $P < 0.05$ ); The use of the combined ABP-ABE teaching system helps to reduce students' free time compared to the traditional system, indicating its effectiveness in the application of medical chairs ( $P < 0.05$ ).

All questions in the questionnaire are based on Bloom's taxonomy, which is used in educational research to classify learning activities at different cognitive levels, from basic memory to higher-order learning goals such as memory, understanding, application and skills analysis, evaluation, and creativity.[32] Texts are the primary source of basic knowledge and require students to read and memorize. Meanwhile, problem analysis requires students to



analyze events in the context of real-life medical situations, using the knowledge gained to solve real-life medical and clinical problems. The results of the ABP-ABE System Score Analysis show that the clinical case analysis score is much better than the basic knowledge score, meaning that the ABP-ABE Integrated Knowledge Model can develop communication, creative thinking and knowledge skills. This is very similar to the overall goal of medical education.

Based on an analysis of students' perspectives and skills, measured through surveys in both systems, it was found that students in the ABP-ABE group were more likely to model using a balanced approach between study and work. Positive effects of the ABP-ABE teaching model have been recorded in students in extracurricular areas such as comprehension, communication skills, clinical reasoning, self-study skills, collaboration skills, communication skills and knowledge acquisition.

While previous studies have attempted to implement ABP or ABE training models in teaching at different types of universities,[33][12][17] very few studies have focused on integrating ABP-ABE training in obstetrics and gynecology. Ginzberg et al. applied problem-based teaching and case-based learning (PBL-ABC) in medical students' discussions of cost-related health topics, demonstrating that problem-based teaching and case-based learning (PBL-ABC) are effective ways to interact with public health.[34] Another study implemented an ABP-ABC teaching method in six lessons to improve students' leadership skills without taking time away from academic training.[20] In addition, Naing et al. combines inverted classroom and PBL into a course in hyperthyroidism, thereby improving student learning and outcomes.[8]

This study was similar to the studies mentioned above so it is suggested that mixed methods improve learning outcomes in students. As for the time required, we agree with Ginzburg [34], but we disagree with Naing et al.[8] Furthermore, we differ from all previous studies by being a study conducted on the different skills that students can acquire by incorporating the ABP-ABE teaching method in the process of analyzing different types of small groups. It includes students enrolled in the 10th semester and gynecology interns. In summary, this study investigates the effectiveness of the ABP-ABE integrated teaching method to improve general understanding of the professional environment, student-teacher interaction and communication skills, student-teacher communication skills, clinical reasoning, and self-study skills. Skills of cooperation and understanding. It should be noted that the EBA eliminates the need for explicit error removal procedures, which benefits people with significant memory impairment. [35]



This study is similar to the studies mentioned above so it is suggested that mixed methods improve students' learning outcomes. As for the time needed, our study had some limitations. First, we analyze the results of a chair of the boarding department, which may vary in the facilities. Secondly, there was no blinding procedure in this study, so some bias in the analysis was inevitable preventing teachers from blindly observing students' leadership qualities which is influenced by self-efficacy and the development of interpersonal relationships.–Thirdly, our study was based on a course in gynecology; in the future it is proposed to conduct multicenter randomized trials with large samples, with different chairs and long-term follow-up.

## 5 CONCLUSION

The ABP-ABE teaching method can be effective in improving the clinical skills and learning ability of medical students, particularly those in gynecology. This method facilitated preclass preparation and provided immediate feedback. In addition, the integrated ABP-ABE teaching method improved students' understanding, student-teacher interaction, communication skills, clinical thinking skills, self-study skills, cooperation, and the ability to absorb knowledge.

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